

Student Name:

Student id:

Sect #: Serial:

University of Bahrain

College of Information Technology
Department of Computer Science

ITCS242: Assembly Language Programming

Quiz #1: Data Representation & Architecture

SHOW DETAILED WORK on the sheet back PLEASE!!!

Part #1: Computer Organization and operation

{ 10 pts }

- 1) The instruction operands may be located in many places such as: *CPU registers* and *Main memory location*.
- 2) The main memory addresses used by the hardware are called *physical*, while the addresses used by the programmer are *symbolic*.
- 3) The flag used to select the regular/single-step execution mode is *TRACE*. The flag that indicates whether the operation result has odd or even number of ones is *PARITY*.
- 4) If a computer has **40** address lines and **64** data lines, the maximum size of directly addressable main memory is $2^{40} / 2^{30} = 1024$ Giga bytes.
- 5) In real-address mode, the logical address **2FCA:9ABF** is converted to the physical address $2FCA0+9ABF = 3975F$

Part #2: Data Representation

{ 10 pts }

- 6) $(4F9C)_{16} + (2A73)_{16} = (7A0F)_{16}$
- 7) The number of bits used to represent any character in Unicode is *16*, and the number of bits used to represent any character in ASCII is *8*.
- 8) The largest signed decimal number that can be stored in **24** bits is $+2^{24-1} - 1$. The smallest signed decimal number that can be stored in **24** bits is -2^{24-1} .
- 9) Using 8 bits to store numbers show how the computer stores **+72** *0100 1000* and **-72** *1011 1000*.
- 10) Using **8** bits to store numbers, show how the computer performs the operation $(59 - 81)_{10}$.

$$\begin{array}{rcll} +59 = 0011\ 1011 & \rightarrow \rightarrow & 0011\ 1011 \\ +81 = 0101\ 0001 \rightarrow -81 = 1010\ 1111 & \rightarrow \rightarrow & +\ 1010\ 1111 \\ & & 1110\ 1010 \end{array}$$

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- 11) The flag that indicates whether the result of operation is positive or negative is *sign*. The flag that indicates whether the operation produces a carry from bit 3 to bit 4 is *auxiliary carry*
- 12) The address of the next instruction is computed by adding *the length of the currently executed instruction* to the *PC* register.
- 13) Briefly describe two actions performed in the instruction decode step.
- *Determine the type of operation involved in the fetched instruction.*
 - *Determine the number and locations of operands in the fetched instruction.*
- 14) If a computer has **32** address lines and **40** data lines, the maximum size of directly addressable main memory is $2^{32} / 2^{20} = 4096$ Mbytes.
- 15) In real-address mode, the logical address **5E9B:29AC** is converted to the physical address **5E9B0+29AC = 6135C**

Part #2: Data Representation

{ 10 pts }

- 16) $(26053)_8 + (37601)_{16} = (721054)_8 + (37601)_{16} \rightarrow (673001)_8 + (26053)_8 = (721054)_8$
- 17) The number of bits needed to represent the number 976 is **10**, and the number of bytes needed to represent the string "976" is **3**.
- 18) Using 8 bits to store numbers show how the computer stores +64 **0100 0000**
and -64 **1100 0000**
- 19) The largest signed decimal number that can be stored in 40 bits is $+2^{40-1} - 1$. The smallest signed decimal number that can be stored in 40 bits is -2^{40-1} .
- 20) Using 8 bits to store numbers show how the computer performs the operation $(40 - 78)_{10}$.
- $$\begin{array}{rcl} +40 = 0010\ 1000 & \rightarrow \rightarrow & 0010\ 1000 \\ +78 = 0100\ 1110 \rightarrow -78 = 10110010 & \rightarrow \rightarrow & + \frac{0100\ 1110}{1101\ 1010} \end{array}$$